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EXAMINER

LEE, S

ART UNIT

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/330,418

Applicant(s)

Taylor et al.

Examiner
Sin J. L

Group Art Unit
1752



☒ Responsive to communication(s) filed on Jun 11, 1999

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire three month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-8 and 14-18 is/are pending in the application

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-8 and 14-18 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been
☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 7 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. ✓

In claims 7 and 18, on the third and fourth lines from the bottom, applicants recite, "optionally substituted or unsubstituted heterocyclic having 1 to 3 ring members . . .;". The Examiner is unsure as to what applicants mean by this. Do they mean that R can be 1 to 3 heterocyclic rings or do they mean that R can be *a* heterocyclic ring having 1 to 3 ring atoms? If latter is what applicants meant, how can there be only 1 or 2 ring atoms making up *a* heterocyclic ring (at least 3 atoms are necessary to make a ring)? Appropriate correction or clarification is required.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

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4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 7-8, and 14-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Shida et al (6,060,207).

Shida et al teach a positive chemically amplified resist which is a photosensitive composition comprising a photoacid generator and a resin which contain a group to be decomposed by acid, and their invention is within the scope of the present invention. See particularly, col.2, lines 32-33, lines 46-53, col.5, lines 66-67, col.6, lines 1-15, col.7, lines 43-48, lines 55-66, col.8, lines 15-23, lines 40-50, col.10, lines 4-9, col.23, lines 55-61, Example I-2, Synthesis Example I-7, Example I-34 to I-36, Synthesis Example I-8, Example I-37 to I-40, Synthesis Example I-15, Example I-78 to I-80, Synthesis Example I-16, Example I-81 to I-84, Synthesis Example I-59, Example I-320 to I-322, Example II-2, Synthesis Example II-20, Example II-148 to II-151, Synthesis Example II-21, Example II-156 to II-159, Synthesis Example II-24, Example II-180 to Example II-183, Synthesis Example II-25, Example II-188 to Example II-191.

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In Example II-148 to II-151, II-188 to II-191, Shida et al teach a chemically amplified resist comprising a photoacid generator and a resin containing *isobornyl* methacrylate (*a [2,2,1] bridged system*), menthyl methacrylate and methacrylic acid units. Shida et al coat the solution of the resist on a *silicon wafer* before exposing it and then developing to form a pattern.

In Examples I-36 and I-322, Shida et al teach a positive-acting photoresist comprising a resin containing *fenchyl* methacrylate (or fenchyl acrylate) and alpha-chlorofluoroethyl acrylate units.

In Examples I-81 to I-84, Shida et al teach a chemically amplified resist comprising a photoacid generator and a resin containing *piny*l methacrylate, t-butyl methacrylate and methacrylic acid. Shida et al coat the resist solution on a *silicon wafer* before exposing it and then developing it to form a pattern.

In Examples II-156 to II-159, Shida et al teach a chemically amplified resist comprising a photoacid generator and a resin containing *tetrahydropyranyl* methacrylate (*which is a heteroalicyclic group presently claimed*), menthyl methacrylate and methacrylic acid units. Shida et al coat the resist solution on a *silicon wafer* before exposing it and then developing it to form a pattern.

In Examples I-2 and II-2, Shida et al teach a resin containing allyl methacrylate, citronellyl methacrylate (or menthyl methacrylate) units.

With respect to present claim 7, first of all, Shida et al teach (in Examples II-148 to II-151, II-188 to II-191, Examples I-81 to I-84, and Examples II-156 to II-159) the presently

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claimed photoresist composition of claim 1. Furthermore, the resins taught in these examples all fit the presently claimed formula (I) of claim 7 since the mole percentage variables b and c can be zero percent according to the present specification (pg.10). For the same reason, the resins taught in Shida et al also fit the presently claimed formula (I) of present claim 18.

With respect to present claim 8, Shida et al also inherently teach the limitation of present claim 8. Claim 8 requires that the polymer comprises pendant acid-labile groups that have anchimeric assistance value A which is greater than that of pendant polymer moieties of -C(=O)Oadamantyl, -C(=O)Onorbornyl, or -C(=O)O cyclohexyl. On page 5, lines 1-12, of the specification, applicants give examples of pendant photoacid-labile groups which meet such requirement, and the examples include acid-labile esters of isobornyl, esters of fenchol, pinenol, and 2,2,1-bridged systems, esters of heteroatom-containing groups, and alkenyl esters. Since Shida et al do teach the polymers containing these acid-labile groups, it is inherent that Shida et al's polymers comprise pendant acid-labile groups having the "A" value as required by present claim 8.

6. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shida et al (6,060,207).

In Example II-2, Shida et al teach a copolymer of *allyl methacrylate* (which meets the presently claimed formula of claim 6) and menthyl methacrylate. Although Shida et al use the copolymer for a negative type resist in this specific example, the prior art clearly teach in col.8, lines 15-31 that a copolymer of a monomer having menthyl group and a monomer having an

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acid-decomposable functional group can be used in a positive type chemically amplified resist by incorporating a photoacid generator therein. Allyl ester (as well as 3-buten-1-yl ester) is listed in the prior art as one of the examples of acid decomposable functional group in col.8, line 50.

Therefore, it would have been obvious for one of ordinary skill in the art to use the copolymer of allyl methacrylate and menthyl methacrylate taught in Example II-2 in a positive type chemically amplified resist by incorporating a photoacid generator therein since the prior art clearly teaches of doing so.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shida et al (6,060,207) in view of Goodall et al (WO 97/33198).

Shida et al do not teach the presently claimed acid-labile group comprising optionally substituted cycloalkyl group having 3 or 4 ring carbon atoms. Goodall et al teach (see claim2) the equivalence (as protecting groups that are acid cleavable by photoacid generators) of isobornyl group or tetrahydropyranyl group to *dicyclopropylmethyl group and dimethylcyclopropylmethyl group (both of which are substituted cycloalkyl group having 3 ring carbon atoms as presently claimed)*. As described above, Shida et al teach (in Example II-148 to II-151, II-188 to II-191) a chemically amplified resist comprising a photoacid generator and a resin containing *isobornyl* methacrylate and also teach (in Examples II-156 to II-159) a chemically amplified resist comprising a photoacid generator and a resin containing *tetrahydropyranyl* methacrylate. Since the isobornyl group or tetrahydropyranyl group are art-recognized equivalents to the dicyclopropylmethyl group and dimethylcyclopropylmethyl group,

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one of ordinary skill in the art would have found it obvious to substitute the isobornyl or tetrahydropyranyl group of Shida et al's resin for the dicyclopropylmethyl or dimethylcyclopropylmethyl group with a reasonable expectation that these latter two would function the same way as the isobornyl or tetrahydropyranyl group. Therefore, Shida et al in view of Goodall et al teach the present invention of claim 4.

8. Claims 1-2, 7-8, and 14-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Allen et al (5,786,131).

Allen et al teach a positive tone, radiation sensitive composition comprising a photoacid generator and a polymer made of isobornyl methacrylate, methyl methacrylate and t-butyl methacrylate units. See particularly, col.1, lines 66-67, col.2, lines 1-4, lines 10-14, lines 18-19, lines 37-49, col.3, lines 50-51, col.4, lines 5-12, and *Examples 3-4*.

With respect to present claims 7 and 18, Allen et al's polymer teaches the presently claimed polymer of formula I since b of the formula can be zero percent according to the specification, and R of the formula can be methyl (an alkyl) group or t-butyl (substituted alkyl).

Allen et al also inherently teach the limitation of instant claim 8. Claim 8 requires that the polymer comprises pendant acid-labile groups that have anchimeric assistance value A which is greater than that of pendant polymer moieties of -C(=O)Oadamantyl, -C(=O)Onorbornyl, or -C(=O)O cyclohexyl. On page 5, lines 1-12, of the specification, applicants give examples of pendant photoacid-labile groups which meet such requirement, and one of the examples is "acid-labile esters of optionally substituted isobornyl". Since the polymer disclosed in Examples 3-4 of

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Allen et al contains isobornyl methacrylate (acid-labile ester of isobornyl), it is inherent that Allen et al's polymer comprises pendant acid-labile groups having the "A" value as required by instant claim 8.

With respect to present claims 14-17, Allen et al teach (Examples 3-4) the coating of their resist formulation on a silicon wafer, and thus the prior art teaches the present inventions of these claims.

9. Claims 1, 3, 7-8, 14-18 are rejected under 35 U.S.C. 102(a) as being anticipated by Johnson et al's Evaluation of TER-SYSTEM resist for 193 nm Imaging Proceedings of SPIE-International Society for Optical Engineering, vol.3049, pg 997-1009 (March 1997).

Johnson et al teach a chemically amplified positive deep UV resist consisting of photoacid generator, solvent and a terpolymer composed of methyl methacrylate, methacrylic acid and an acid labile acrylic ester. See particularly pg.998, first and second paragraphs, pg.1000, last two lines, and pg. 1001, first line. Johnson et al's terpolymer where R = tetrahydropyranyl or tetrahydro-4-methyl-2-oxo-2H-pyran-4-yl as disclosed on page 998 teach the present inventions of claims 1 and 3 since both of these R groups meet the present limitation of the optionally substituted heteroalicyclic group. The prior art's terpolymer also fits the Formula I of instant claims 7 and 18 since the variable "b" can be zero percent according to the present specification, and the R of the formula can be a methyl (an alkyl) group.

With respect to present claim 8, Johnson et al also inherently teach the limitation of instant claim 8. Claim 8 requires that the polymer comprises pendant acid-labile groups that

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have anchimeric assistance value A which is greater than that of pendant polymer moieties of -C(=O)Oadamantyl, -C(=O)Onorbornyl, or -C(=O)O cyclohexyl. On page 5, lines 1-12, of the specification, applicants give examples of pendant photoacid-labile groups which meet such requirement, and one of the examples is "esters of optionally substituted heteroatom-containing groups". Therefore, Johnson et al's terpolymer having tetrahydropyranyl or tetrahydro-4-methyl-2-oxo-2H-pyran-4-yl group inherently comprises pendant acid-labile groups having the "A" value as required by instant claim 8.

With respect to present claims 14-17, Johnson et al teach that their resist formulations are spin coated on silicon wafers, and thus the prior art teaches the present inventions of these claims.

10. Claims 1-4, 7-8, and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Goodall et al (WO 97/33198).

Goodall et al teach a photoresist composition comprising a polycyclic polymer, which contains recurring acid labile groups that are pendant from the polymer backbone, and a photoacid generator. See particularly, pg.1, lines 10-12, lines 17-22, lines 25-26, pg.6, lines 24-27, pg.7, lines 6-7, lines 11-14, lines 26-29, pg.8, lines 1-30, pg.9, lines 1-10, pg.10, lines 11-30, pg.11, lines 1-6, pg.12, lines 1-14, pg.48, lines 11-13, pg.49, lines 9-16, pg.81, lines 5-7, claims 1-2, 11-12.

On pg.8, Goodall et al teach the acid labile polycyclic monomer having formula I which makes their polymer. According to the formula, the acid labile group $-(CH_2)_n C(O)OR^*$ has to be

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always present, and ten examples for the R* moiety (i.e., acid decomposable moiety) include isobornyl, tetrahydrofuranyl, tetrahydropyranyl, dicyclopropylmethyl, and dimethylcyclopropylmethyl group. Since there are only ten examples to choose from, it would have been obvious to one of ordinary skill in the art to choose any one of these groups (i.e., *isobornyl*, tetrahydrofuranyl (*heterocyclic group*), tetrahydropyranyl (*heterocyclic group*), dicyclopropylmethyl (*substituted cycloalkyl group having 3 ring carbon atoms*), or dimethylcyclopropylmethyl (*substituted cycloalkyl group having 3 ring carbon atoms*)) as a matter of choice to be the R* moiety with a reasonable expectation that any one of these would work well as the R* moiety. Furthermore, Goodall et al teach on pg.10 the optional second monomer of the formula II that is to be copolymerized with their acid labile polycyclic monomer. According to the formula, R⁵ to R⁸ can independently be -(CH₂)_n-C(O)OR'' (or any of the other six examples listed on lines 22-24 of pg.10) wherein R'' represent H, alkyl, *monocyclic* and polycyclic *cycloaliphatic moieties*, cyclic ethers, cyclic ketones and cyclic ester (lactones). For the specific examples for the cycloaliphatic monocyclic moiety, the prior art lists *cyclopropyl*, *cyclobutyl*, cyclopentyl, and cyclohexyl. First of all, for R⁵ to R⁸, there are only seven examples to choose from, and therefore it would have been obvious to one of ordinary skill in the art to choose -(CH₂)_n-C(O)OR'' as a matter of choice. Then there are only seven different kinds of examples for the R'' group, and thus it would have been obvious to one of ordinary skill in the art to choose the monocyclic cycloaliphatic moiety such as cyclopropyl (*cycloalkyl group having 3 carbon atoms as presently claimed*) or cyclobutyl (*cycloalkyl group having 4 carbon atoms as*

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presently claimed) as a matter of choice to be the R" group. Therefore, the prior art teaches the present inventions of claims 1-4.

With respect to present claims 7 and 18, Goodall et al's resin as described above in this Paragraph also fits the present formula I since according to the present specification, b and c of the present formula 1 can both be zero percent.

With respect to present claim 8, Good et al also inherently teach the limitation of present claim 8. Claim 8 requires that the polymer comprises pendant acid-labile groups that have anchimeric assistance value A which is greater than that of pendant polymer moieties of -C(=O)Oadamantyl, -C(=O)Onorbornyl, or -C(=O)O cyclohexyl. On page 5, lines 1-12, of the specification, applicants give examples of pendant photoacid-labile groups which meet such requirement, and the examples include acid-labile esters of isobornyl and esters of heteroatom-containing groups, and esters of cycloalkyl groups having 3 or 4 ring carbons atoms. Since Goodall et al do teach the polymers containing these acid-labile groups, Goodall et al inherently teach polymers comprising pendant acid-labile groups with the presently claimed "A" value.

With respect to present claims 14-17, Goodall et al teach the coating of their resist solution onto a substrate such as a silicon wafer (see pg.1, lines 17-22, lines 25-26, pg.7, lines 11-14, pg.812, lines 5-7). Therefore, the prior art teaches the present inventions of claims 14-17.

11. The following references can not be used for rejecting the present claims (because of the dates) but are cited here as a matter of interest.

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Aoai et al (EP 0 877 293 A2) teach a positive photosensitive composition comprising a photoacid generator and a resin containing at least one polycyclic-type alicyclic group. Among the examples for the alicyclic moiety in the polycyclic-type alicyclic group shown on pg.14 of the reference, there are [3,2,0] bridged ring (see the structure (1) on pg.14) and [2,2,1] bridged ring (see the structure (23) on pg.14) both of which are presently claimed.

Sato et al (6,054,254) teach a material for manufacturing a semiconductor device which is a composition comprising a photoacid generator and an acid-decomposable compound. Among the examples for the acid-decomposable compound shown in the reference, there are polymers containing tetrahydrofuranyl methacrylate unit or tetrahydropyranyl methacrylate unit (see the structure I-48 and I-49 in col.17-18) both of which are optionally substituted heteroalicyclic groups as presently claimed.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is (703) 305-0504. The examiner can normally be reached on Monday-Friday from 8:30 am EST to 5:00 pm EST.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ms. Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3599 for after final responses or (703) 305-7718 for all other responses.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0661.

S. Lee

S. Lee
June 15, 2000


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